

REMARKS

Claims 1 through 9 are rejected. Claims 1, 4 and 7 are amended. Claims 1 through 9 remain in the application.

Applicants request reconsideration and reexamination of the above-identified application in view of the amendments made to the specification and claims. The following remarks state Applicants' bases for making this request and are organized according to the Examiner's Action by subject matter.

Double Patenting

The Examiner rejects claims 1 through 7 on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 1 through 7 of U. S. Patent No. 6,754,682.

Applicants are submitting a Terminal Disclaimer to overcome this rejection.

Applicants wish to clarify the Examiner's argument that claims 2, 5 and 6 of the application are identical to claims 2, 5 and 6 of the patent. However, each of claims 2, 5 and 6 are dependent claims. While the language of those depending claims may be the same, Applicants respectfully submit that the inventions in the application and patent can not be identical if the inventions in parent claims 1 and 4 are not identical.

Claim Rejections 35 U.S.C. 102

The Examiner rejects claims 1 through 9 under 35 U.S.C. 102 as being anticipated by U. S. Patent No. 6,370,626 to Gagne et al. Applicants respectfully traverse this rejection.

Gagne et al. disclose a disk array storage device in which a first application on a host interacts with data stored in a first logical volume, or standard device. The storage device also includes a business continuation volume (BCV) that can shift between first and second operating modes. In its first operating mode, the BCV device attaches to the standard device to act as a mirror. In the second operating mode the BCV device is detached from the standard device. Data on the BCV is then available for interaction with a second application independently of continuing interactions between the first application and the standard device.

The disclosure of Gagne et al. is particularly directed to overcoming a problem inherent in handling "write pendings", that is, write data that has been stored in a cache and not yet written to physical tracks in a storage device. Gagne et al particularly disclose a process for handling this issue expeditiously in an "instant split" process that involves track locking. That is, a single track of the standard device and corresponding single track of the BCV device are locked during the time a split occurs, the lock being released upon completion of the split of that track.

More specifically the embodiment of FIG. 1 of Gagne et al., discloses a logical volume 34 as a standard device designated as logical volume LV1; the logical volume 35 is a fixed mirror. The logical device 36 is the BCV device. In its first operating mode it acts as another mirror for the LV1 logical volume. In a second operating mode the BCV device operates as an independent storage device constituting an LV2

volume. In particular embodiment shown in FIG. 1 the logical device 37 then acts as a fixed mirror for the BCV device 36 when it is operating in the second operating mode.

As stated in the application:

The introduction of the instant split command [of Gagne et al.] overcame the unacceptable lock times of the original split command. However, applications continue to grow in complexity and the data associated with those applications continues to grow. Whereas an application and associated data may originally have been stored on a single standard device, such applications and associated data now may be stored on multiple standard devices. Some applications now require storage that exceeds the capacity of a single disk array storage device necessitating that the distribution of a single application over two or more disk array storage devices with hundreds of standard devices. In a database application, for example, one standard device may contain the database data while another standard device contains an the associated log file. In such multiple device applications it was possible to institute a multiple instant split operation by issuing a series of discrete instant split operations for all the BCV devices. These would then be processed.

However, each discrete instant split operation was dispatched separately, so the order in which the instant splits occurred on different BCV devices was unpredictable. Consequently it was possible for the application program to write to a logical device that was queued to be split, but for which the split had not yet issued. This could produce inconsistent data.

Application, page 6, lines 1-25

The object of Applicants' invention is to allow such a split operation to occur in a consistency group whereby the logical order of the writes in the standard device will be replicated in the BCV device.

The Claims

The independent claims defines a method (claim 1), a structure (claim 4) and a program (claim 7) for providing consistent split of information in one or more BCVs attached to multiple standard devices over which the data must be maintained in a consistent fashion (i.e., a consistency group). Gagne et al. do not disclose such a methodology, apparatus or program. Rather, Gagne et al. discloses a single standard LV1 device 34 and a single BCV device 36. There is no consistency issue involved in Gagne et al.

With respect to the claimed request data structures in each of independent claims 1, 4 and 7, FIG. 2 and corresponding portions of the specification disclose one example of a request data structure. Applicants respectfully submit that the referenced language at Column 5, lines 5-18 of Gagne et al. does not disclose or suggest any request data structure.

With respect to write prevention or locking, FIG. 5, element 168 in Gagne et al. disclose a step by which a lock is obtained on an address track to avoid any change occurring to the track during the processing of any write pending processes for that track. Each claim, however, describes locking or prevention of writes to any first logical device in a consistency group. In the specifically disclosed embodiment the IOS level for each of these standard or first logical devices is raised to block any writing operation to any track on such devices that might be initiated by an application.

With respect to the shifting of second logical devices after the write prevention operation or locking occurs, an

example is the initiation of instant split operation in one or more BCV devise while all the first logical devices in the consistency group are locked. FIG. 5 of Gagne et al. depicts the method by which such a split actually occurs. However, Gagne et al. do not disclose the concept of initiating multiple instant split operations or shifting the operating modes of multiple second logical devices, such as the BCV devices.

With respect to the enabling of write operations, Gagne et al do disclose locking a single track as part of the processing of a write pending. However, as disclosed in the application and in accordance with the invention, the enablement of write operations is applied to all the first logical devices that are in the consistency group. As Gagne et al. do not disclose any consistency group, Applicants respectfully submit that the language at Column 14, lines 14-20 of Gagne et al. do not disclose or suggest such a multiple operation.

The Examiner also rejects depending claims 2, 3, 5, 6, 8 and 9. Applicants respectfully submit that each of these depending claims should be allowable for the same reasons claims 1, 4 and 7 are argued to be allowable above. They are claims of narrowing scope to which Applicants are entitled. Claims 2, 5 and 8 for example further define the process of a shifting operation that occurs in each BCV device in a logical group. Claims 3, 6 and 9 define those processes still further.

Related Prior Art

The Examiner has recited additional prior art considered to be pertinent to Applicants' invention. Applicants

respectfully submit that none of these references taken singly or in combination with any of the other cited references including Gagne et al. either disclose or suggest Applicants' invention.

In summary, Applicants are amending claims 1, 2, 4 and 7 to more clearly define Applicants' invention. For the reasons enumerated above, Applicants respectfully submit that each of claims 1 through 9 defines an invention that is novel and would not have been obvious to a person of ordinary skill in the art at the time Applicants made their invention. Consequently Applicants respectfully request the Examiner to reconsider her rejections and allow claims 1 through 9.

If there are any questions, we urge the Examiner to call us collect.

Respectfully Submitted,

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